3.2 MARINE WATER AND SEDIMENT QUALITY

This section describes environmental and regulatory settings related to the marine water quality and sediment resources in the Project area, particularly Santa Monica Bay (Bay), and the greater Southern California Bight (SCB) and potential effects of the beach nourishment and dune restoration project on public trust resources and values.

As defined in Section 13050 of the California Water Code, water-quality inputs of concern include discharges that create pollution, contamination, or nuisance or that release toxic substances deleterious to humans, fish, bird, or plant life. Moreover, the significance of many water-quality impacts are inextricably linked to adverse effects on marine and estuarine species and habitats; Section 3.3, *Marine Biological Resources*, details these impacts.

3.2.1 Environmental Setting Pertaining to the Public Trust

The area of potential impact for Marine Water and Sediment Quality is confined to offshore areas that are included in the Off-Site Project Areas, but activities occurring within the Broad Beach Restoration Area (Project area) would directly and indirectly impact these resources. The Project and its alternatives could potentially impact the quality of local marine waters and sediments. The severity of those impacts are a function of the Project's location within the physiographic environment, the physicochemical properties of the receiving waters and sediments, the circulatory and dispersive capacity of the regional oceanographic regime, and any present levels of contamination. This subsection discusses each of these aspects in detail.

<u>Broad Beach Restoration Area Location and Description</u>

The Project area encompasses approximately 44 acres extending laterally for more than 6,700 feet from Lechuza Point to Trancas Creek Lagoon, including both public trust lands and adjacent private lands that support residential uses. The Project area also includes existing vertical and lateral access easements that could be impacted by the Project. Additionally, it includes the Zuma Beach parking lot adjacent to Trancas Creek, proposed for temporary construction staging.

<u>Off-site Project Areas Location and Description</u>

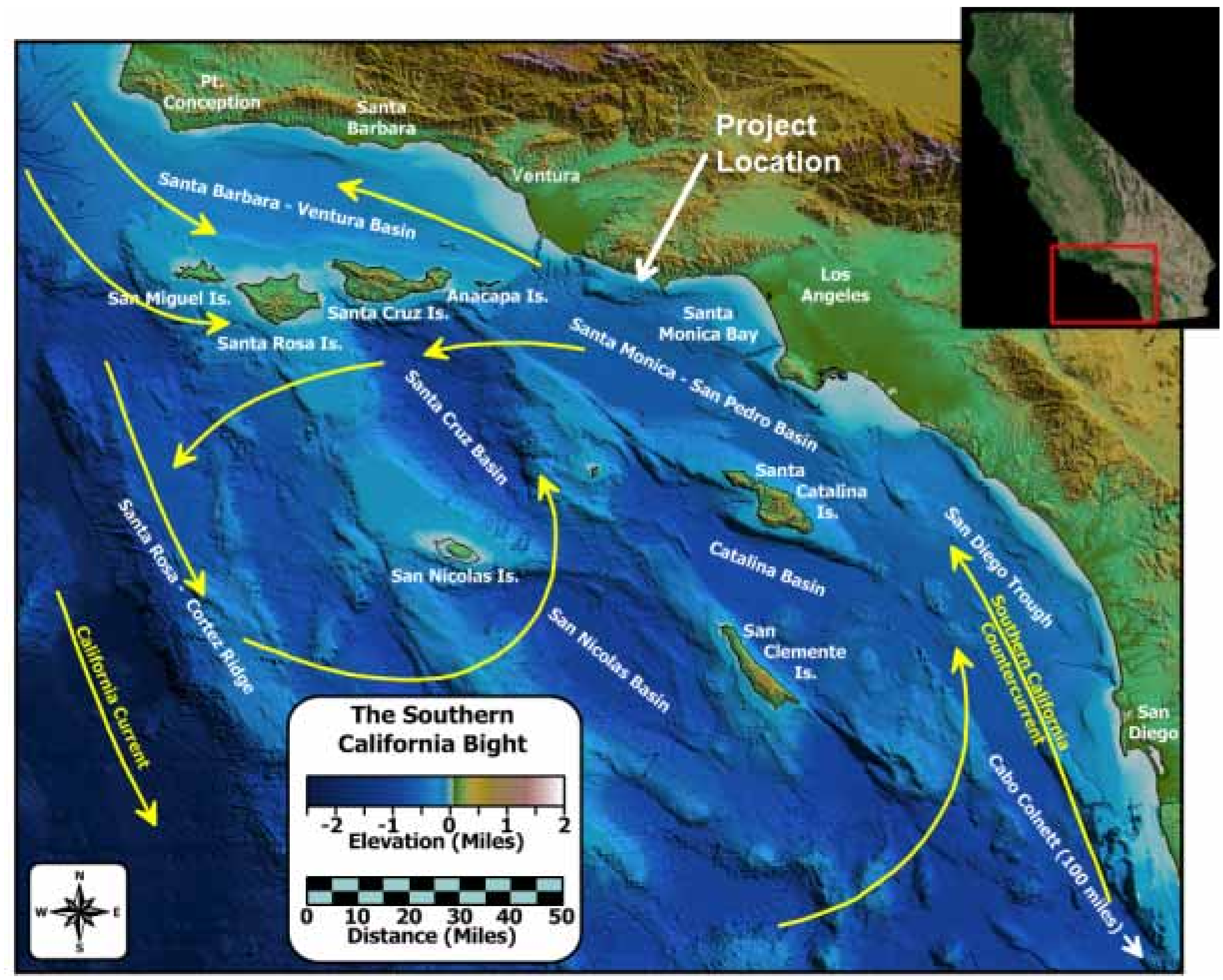
The Project also includes the dredging of sand sources located offshore Ventura Harbor, Trancas, and Dockweiler Beach. Transit routes for dredged material from these sand sources and State tidelands in the vicinity of these waters result in an approximate 65-mile stretch of water that could be impacted by the Project.

<u>Physiography</u>

The Broad Beach Restoration Area and the Off-Site Project Areas lie within the larger geographic region commonly known as the SCB, wherein the characteristic north-south trending coastline found off much of western North America experiences a significant curvature or indentation. The SCB is bounded to the north by Point Conception, in Santa Barbara County, and extends 400 miles to the south, to Cabo Colnett, near Ensenada, Mexico.

Coastal southern California, the Channel Islands, and the local portions of the Pacific Ocean encompassing the Project area and sand source sites all lie within the SCB, which extends offshore to the Santa Rosa-Cortez Ridge (Figure 3.2-1).

Figure 3.2-1. Project Location and Surface Water Circulation within the Southern California Bight



Source: Hickey 1972.

The majority of the Project area and Off-site Project area, including Broad Beach, the Central Trancas sand source site, the Dockweiler sand source site, and the transit routes between these locations, lies within the watershed of the Bay, a comparatively shallow subarea of the SCB. The Bay stretches nominally from Point Dume in the north to the northern tip of the Palos Verdes Peninsula in the south. It extends seaward approximately 11 miles to a break in the coastal shelf at a depth of approximately 328 feet. The sand source offshore Ventura Harbor lies slightly to the north of this region, within the portion of the SCB known as the Santa Barbara Channel.

Seafloor Substrates

Intertidal zones within the Project area consist predominately of sand beaches, although rocky shores, tidal flats, coastal marshes, and man-made structures occur along localized sections of the shoreline. Sandy and soft-bottom habitats dominate subtidal substrates within the Bay in all depth zones, with the occurrence of hard-substrate seafloor features being relatively uncommon. Hard-substrate seafloor features that do exist are generally localized and of man-made origin, consisting of jetties, seafloor debris, and artificial reefs. Natural rock outcrops, with their higher relief and structural complexity, are primarily located along the northern and southern portions of the Bay. Natural rocky outcrops occur at the western end of Broad Beach at Lechuza Point, as well as just to the south, at Point Dume.

Short Bank is the only naturally occurring deep rocky area within the Bay, although the walls of the two adjacent submarine canyons also support consolidated sediment surfaces (Figure 3.2-2). Santa Monica Canyon lies in deep water near the center of the Bay, while the deeply incised Redondo Canyon extends to the shoreline approximately 6 miles south of the Dockweiler sand source.

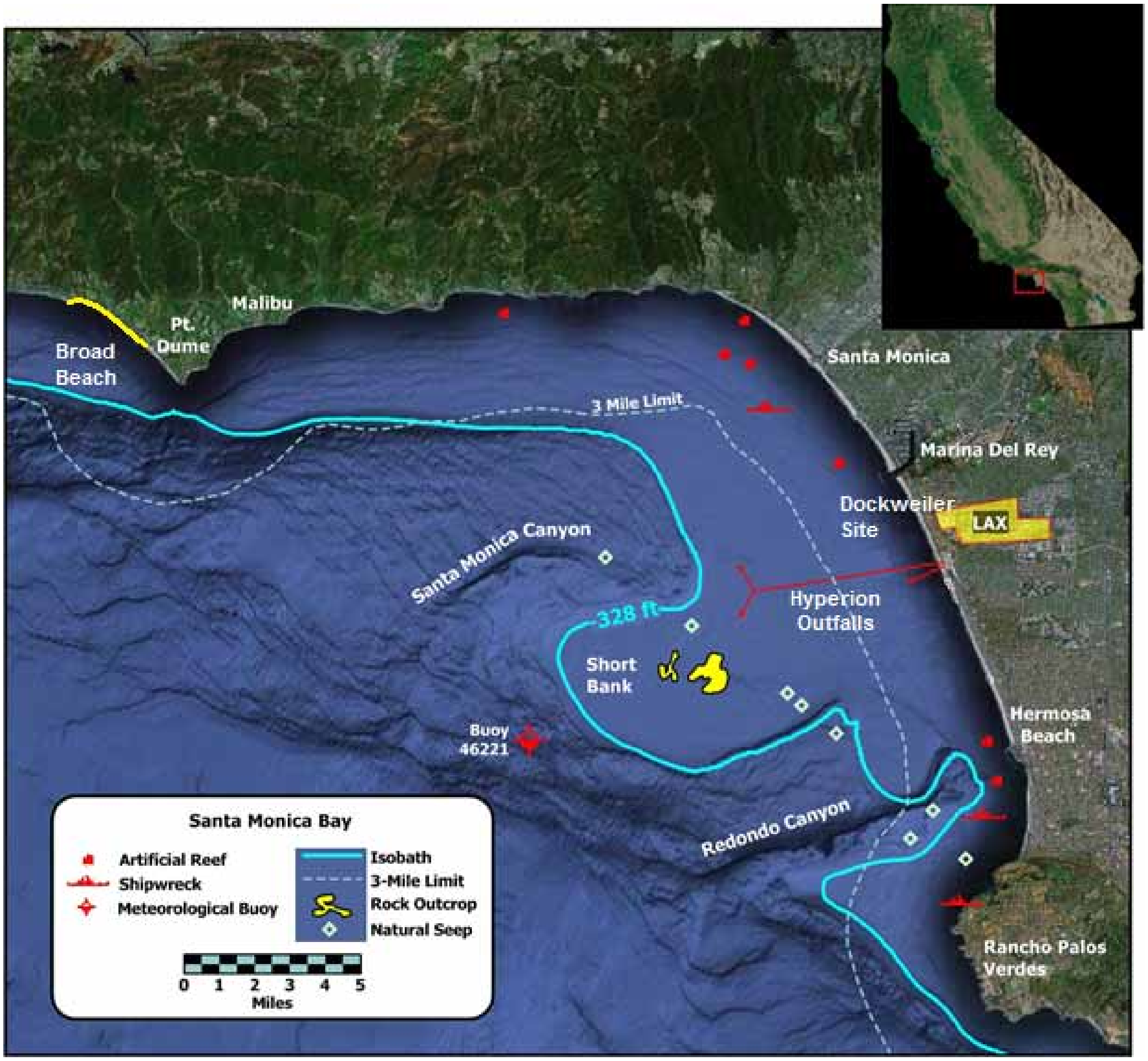
Coastal Features

Artificial reefs and shipwrecks, although anthropogenic in origin, provide limited, but valuable, hard-substrate habitat within the Bay.

Urban Discharges and Freshwater Inflow

The coastline along much of the SCB is heavily urbanized, with nearly 17 million people living along the coastal corridor between Point Conception and the Mexican border (US Census Bureau 2010). Ocean outfalls in the Project area currently discharge treated effluent and other materials into the middle of the Bay and the southern end of the Palos Verdes shelf. Historically, effluent with relatively high levels of chemical contaminants was also discharged near both of these locations.

Figure 3.2-2. Locations of Key Features within Santa Monica Bay



Source: AMEC 2012.

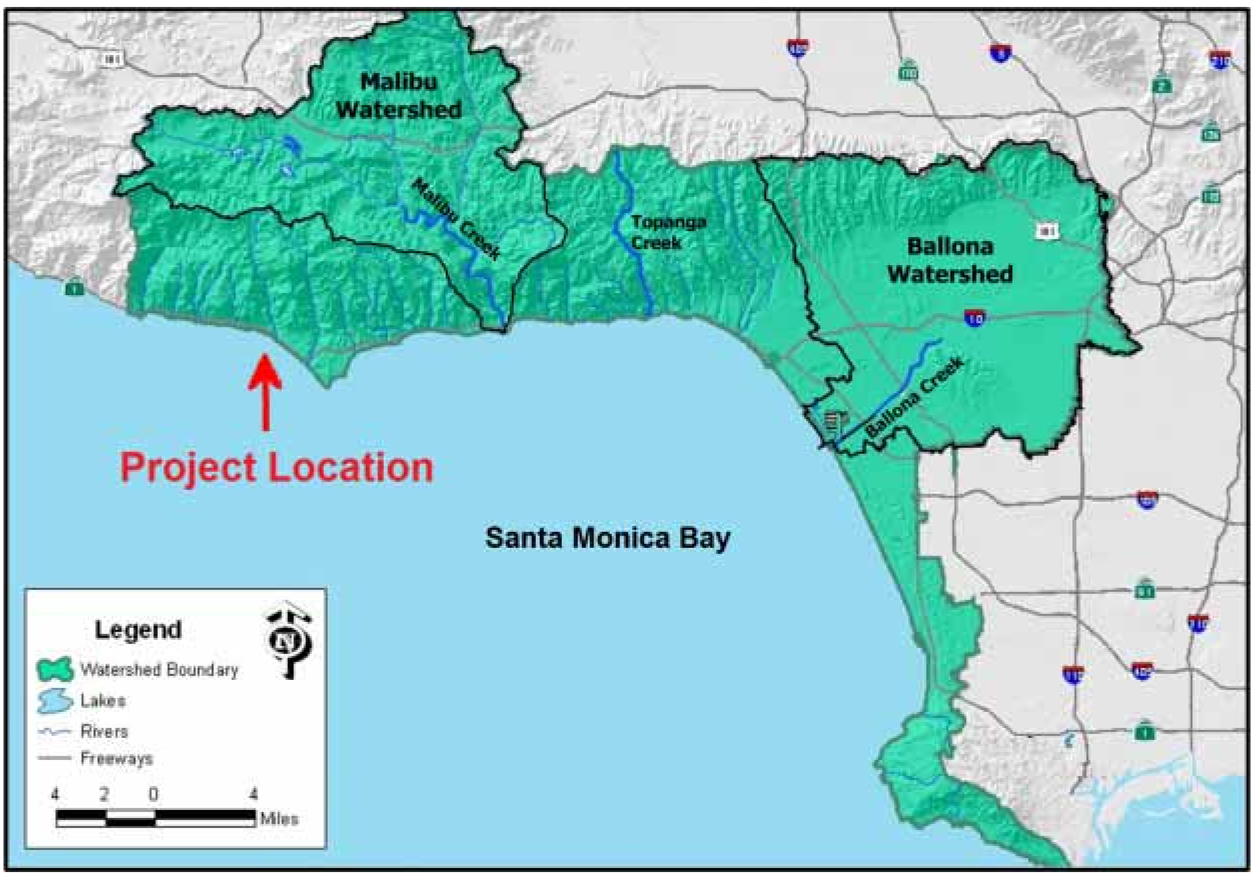
Another ocean outfall discharging treated effluent to the Santa Barbara Channel is located several miles south of the Ventura Harbor sand source site. Additionally, due to the Mediterranean climate of much of southern California, pulses of storm water runoff carry concentrated contaminants, which have accumulated onshore during long dry spells, into the marine waters of the SCB over relatively short storm durations.

Together, these discharges have been a historical source of chemical and biological contaminants found within the region, particularly within the Bay. Although some synthetic organic contaminants sorb onto fine sediment particles and are initially deposited near the discharge location, they can be repeatedly resuspended by surface gravity waves, internal waves, or coastal currents, and transported far from the source

(Noble and Xu 2003). Although testing indicates that the Dockweiler sand source is not contaminated (Moffatt & Nichol 2012), more than 90 percent of surficial sediment within the Bay has been previously shown to be contaminated, often at levels of potential biological concern (Schiff 2000). Other contaminants, such as bacterial and viral pathogens, can remain suspended in the water column where they are transported over great distances by coastal currents.

Freshwater inflow to the Bay comes from municipal and industrial wastewater discharges, surface runoff, creeks, and rivers, as well as dry streambeds that terminate in the Bay. Overall, an area of approximately 414 square miles drains into the Bay (see Figure 3.2-3). Major freshwater sources in the watershed include Malibu Creek, Topanga Creek, and Ballona Creek.

Figure 3.2-3. Project Location within the Santa Monica Bay Watershed Management Area



Source: LARWQCB 2007b.

Within the boundaries of the city of Malibu, there are 62 identified watersheds (MGP 1995). These range from large watersheds, which drain the coastal drainages of the

Santa Monica Mountains, to smaller, coastal terrace watersheds, which often have their headwaters located within a few hundred feet of the ocean. Large coastal watersheds include Ramirez (4.5 square miles), Las Flores (4.75 square miles), Solstice (4.43 square miles), Trancas (8.39 square miles), and Zuma Canyon (8.86 square miles), Topanga (19.68 square miles) and Arroyo Sequit (10.96 square miles). The Broad Beach Restoration Project area falls within the Trancas watershed.

Trancas Lagoon, located 3 miles west of Point Dume in the city of Malibu, is fed by Trancas Creek. As concluded in the Santa Monica Bay Restoration Plan (2008) "*The mouth of the creek is often blocked by a sand berm which prevents tidal exchange and causes the creek water to pond during seasonal high flows.*"

Section 3.2.5 of The Malibu General Plan states that Trancas lagoon is "permanently flooded ….exposed to marine tidal influences during the winter months but …isolated from the Ocean as stream flows decline and sand barriers develop." Accordingly, the plan concludes that "Despite the periodic influences of salt water, these habitats are characterized as predominately freshwater habitats."

Trancas Creek is defined as a perennial stream, running only after heavy rains; in drier years, it does not run at all. The Project's nourishment footprint would taper off at the east end of Broad Beach, just to the west of Trancas Creek or Trancas Lagoon.

The Malibu Creek watershed encompasses undeveloped mountain areas, large-acreage residential properties, and many natural stream reaches, while Ballona Creek is predominantly channelized and highly developed with both residential and commercial properties. A majority of the 193 National Pollutant Discharge Elimination System (NPDES) permitted facilities in the watershed discharge to Ballona Creek (LARWQCB 2007a). Significant sediment and water-quality issues related to Ballona Creek include trash loading, wetlands restoration, trace-organic and heavy metal contamination of creek-mouth sediments, toxicity of both dry-weather and stormwater runoff, and high bacterial indicators at the creek mouth.

Rainfall and the associated freshwater inflow to the SCB are episodic within any given year, and also vary substantially among years (Jenkins and Wasyl 2005). California's coastal climate varies in cycles that last 20 to 30 years. For example, the dry period extending from 1945 to 1977 was followed by an episodically wet period from 1978 to 1998 that included six strong El Niño events (Goddard and Graham 1997). El Niño events are intense, abrupt global modifications of the typical seasonal weather cycle. These events bring unusually heavy rainfall to the SCB and markedly increase the northward transport of warm subtropical water into the region.

The intense storms associated with strong El Niño events generate large waves that impinge on the SCB shoreline and cause significant shoreline erosion. Based on the historic record of multi-decade climate cycles, 1998 was the end of a wet period in California, followed by a return to a dry climate regime (White and Cayan 1998).

<u>Oceanography and Meteorology</u>

A wide variety of oceanographic and meteorological processes affect the fate and effects of contaminants introduced into the SCB. A complete description of oceanographic processes is provided in Section 3.1, *Coastal Processes*, with especially pertinent elements summarized below.

Wind and Rain

Winds within the region are usually light, and exhibit a diurnal variation throughout most of the year (Morris 2006). From evening until early morning, winds are often directed offshore, and they reverse direction to blow onshore after late morning. The heating and cooling of the land situated next to cool coastal waters establishes cross-shore atmospheric pressure gradients that drive these diurnal land-sea breezes. Afternoon land-sea breezes frequently range from 10 to 15 miles per hour (mph). During the evening, when the relatively warm and dry onshore air mass moves over cooler coastal waters, the layer of air in direct contact with the water surface is both cooled and moistened. The resulting marine layer often brings overcast conditions to coastal areas of the Project area. During the day, stronger insolation tends to erode the marine layer in conjunction with wind-induced vertically mixing of the lower atmosphere.

While severe wind events are uncommon within the Project area, strong offshore Santa Ana winds can occasionally reach hurricane strength below passes and canyons surrounding the Project area. In addition, passing winter storms can bring southeast winds to gale force. However, for the most part, damaging winds tend to be rare or highly localized, with winds of 20 mph or greater occurring only about one to two percent of the time from November through May. Southwesterly through westerly winds begin to prevail in the spring and last into early fall.

Rainstorm events are largely restricted to the winter season when extratropical disturbances approach California from the west or northwest. The Project area experiences from 10 to 30 of these North Pacific weather systems per year. On average, 92 percent of the seasonal precipitation falls between November 1 and April 30. As described in the subsequent sections on seawater properties and pollutants, freshwater plumes that form from storm water runoff can have a profound impact on the region's sediment and water quality.

Oceanic Flow

The large-scale oceanic flow field within the SCB is dominated by the California Current System, including the southward-flowing California Current and the northward-flowing Southern California Countercurrent (Hickey 1979, 1992, 1998). The California Current is the dominant oceanic current along the Pacific coast of the United States. This diffuse, southward-flowing current represents the eastern limb of the clockwise-rotating gyre that covers much of the North Pacific Basin.

The California Current transports cool subarctic water southward along the northern and central California coast. Past Point Conception, the current separates from the coast and continues southward beyond the offshore reaches of the SCB (see Figure 3.2-1). However, within the southern SCB, portions of the California Current turn inward toward the coast, where they combine with the northward-flowing Southern California Countercurrent, and form a large, counterclockwise-rotating eddy. Subarctic water, before turning south to form the California Current, is carried along at high latitudes, where it is exposed to precipitation, atmospheric cooling, and nutrient regeneration. As a result, waters of the California Current are characterized by a seasonably stable low salinity, low temperatures, and high nutrient concentrations. Waters within the California Current undergo less seasonal variation than surface waters at similar latitudes along the eastern seaboard.

In contrast to the seawater properties of the California Current, the Southern California Countercurrent brings warmer, saltier, subtropical water northward along the coast. This northward-flowing coastal current traverses the mouth of the Bay, occasionally forming a diffuse clockwise-rotating eddy within the Bay. However, at any given time, low-frequency[1] currents within the Bay are complex and variable.

Flow complexity near the Project site at Broad Beach, as well as at the sand source sites, is a product of competing processes, including local wind patterns, local and remote oceanic pressure gradients, tides, internal waves, and littoral currents driven by surface gravity waves impinging on the shoreline at oblique angles.

To some degree, seasonal surface-circulation patterns within the SCB respond to large-scale changes in coastal surface winds (Di Lorenzo 2003). Normally, the Southern California Countercurrent is driven by an alongshore oceanic pressure gradient that forces coastal waters to move in a northwestward direction that is opposite of the prevailing winds that blow from the northwest. As a result, variation in the speed of the Countercurrent is somewhat dependent on the strength of the opposing winds, and the

[1] Low-frequency currents fluctuate at periods longer than a day and, therefore, exclude most of the tide- and wave-induced flow.

current is strongest when the opposing northwesterly winds relax, which usually occurs between December and February.

However, the majority of the flow variability within the Bay is actually driven by the fluctuations in the large-scale along-shore oceanic pressure gradient, which results from forces generated well outside the SCB, rather than by local wind stress over the Bay (Hickey et al. 2003). As a result, currents can flow in a uniform direction throughout the Bay or, at any given time, they can flow in a clockwise or counterclockwise gyre within the Bay. The mean circulation pattern within the Bay during spring and summer can even form a double gyre, with southeastward nearshore flow along the coastline in the lower half of the Bay and northwestward coastal flow in the northern reaches. These various mean flow patterns tend to persist for 10 or more days with typical flow speeds of 0.3 to 0.5 mph.

Currents within the Bay generally follow isobaths, and strong pulses of cross-shelf flow are rarely observed in low-frequency current records, especially near the seabed, where speeds are generally less than 0.1 mph (Noble and Xu 2003). While the strength and duration of these low-frequency flows are capable of transporting suspended particulates and associated contaminants along the shoreline and out of the Bay, 2- to 4-hour-long pulses of sheared cross-shore flow are primarily responsible for transporting fine sediment and associated contaminants off, rather than along, the shelf. Because of their vertical shear, these pulses transport suspended material near the surface shoreward, in a direction opposite of the deep flow.

The abrupt onset of these sheared current pulses every 12 or 24 hours, depending the diurnal strength of the falling spring tide, indicates that they are internal bores generated over the shelf break by tidal forces. The tidal bores propagate across the shelf and dissipate much of their energy by the time they reach a water depth of 115 feet. Upwelling, wherein nearshore surface waters are replaced by deep cool, nutrient-rich seawater, also affects circulation within the Bay. Upwelling events begin to occur between March and June, when a rapid transition to strong northwesterly wind transports surface water near the coast offshore and down-coast. The nutrients brought to the surface during upwelling drive primary production (phytoplanktonic bloom) that is the hallmark of the productive fishery along the southern California coast.

For most of the year, however, strong currents flow mainly toward the northwest over the narrow Palos Verdes shelf, where they transport resuspended material and the associated contaminants into the Bay.

Seawater Physicochemistry

The physical and chemical properties of seawater are regularly used to evaluate marine water quality. Throughout the SCB, the Southern California Coastal Water Research

Project, the Surface Water Ambient Monitoring Program, and the California Cooperative Oceanic Fisheries Investigations conduct regional assessment programs. Within the Bay, numerous NPDES permits require individual point-source dischargers to regularly monitor receiving water properties. This subsection examines the spatiotemporal variability of these properties within the region and establishes their baseline levels near the Project site.

Physicochemical properties within the Project area exhibit distinct seasonal variations and spatial distributions that arise from the interaction among bottom topography, vertical mixing, horizontal advection, freshwater discharge, and biological processes (Nezlin et al*.* 2004). The seasonal cycles exhibit three basic patterns: (1) a cross-shore gradient; (2) a balance between water masses transported by the California Current from the northwest and the Southern California Countercurrent from the south; and (3) freshwater discharge from Ballona Creek, the mouth of which is located just north of the Dockweiler sand source.

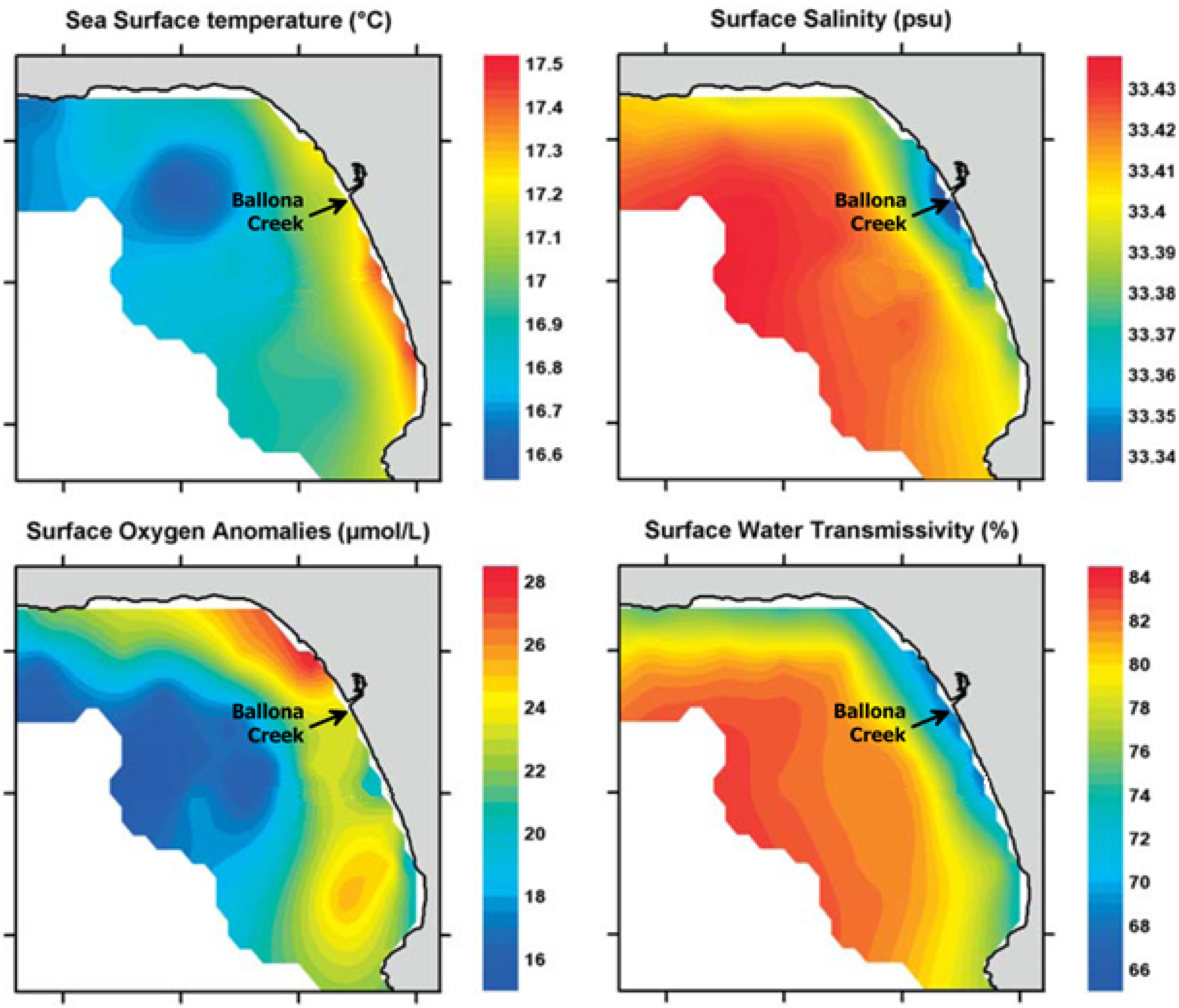
Salinity

Annual mean salinity is relatively uniform across the entire Bay, with values close to 33.40, except for a zone of low salinity along the coast that is related to freshwater discharge emanating from Ballona Creek (Figure 3.2-4). However, the creek's influence is intermittent and relegated to isolated winter rainstorm events, which also transport pollutants from the land into the coastal seas (Dwight et al*.* 2002, Ackerman and Weisberg 2003).

Because of the cumulative influence of winter-storm runoff into the sheltered Bay, seasonal average salinity in the nearshore areas of the Bay typically decreases by 10 percent in winter from the summer maximum. However, much larger fluctuations are evident on shorter time scales. Maximum salinity was 34.34 parts per thousand (ppt) during the summer of 1998 when southerly El Niño winds enhanced the northward transport of high salinity water from southern Baja into the SCB. Minimum salinity was 31.02 ppt during winter floods of 1993.

Except during these kinds of isolated events, vertical salinity gradients tend to be negligible compared to thermal stratification, although surface salinities tend to be slightly higher when the water column is stratified (Chevron 2006, 2007a, 2007b, 2007c, 2007d, 2008c).

Figure 3.2-4. Annual Average Distribution of Seawater Properties within Santa Monica Bay



Source: SCCWRP 2004.

Temperature

Surface water temperatures in the SCB typically range from 52 to 73 degrees Fahrenheit (ºF), with winter and spring temperatures that are typically lower than summer and fall temperatures (see Figure 3.2-4). Compared to salinity, sea-surface temperature exhibits a more pronounced seasonal variation over the 20-year record. As a result, interannual variability is less apparent, although depressed temperatures associated with the 1999 to 2000 La Niña event can be discerned. La Niña events are the opposite of El Niño events. La Niña events are characterized by a strengthening of the California Current relative to the Southern California Countercurrent, resulting in tangibly lower fall and winter seawater temperatures.

A strongly stratified water column restricts the vertical exchange of water parcels and limits initial dilution of contaminants released near the seafloor, such as those discharged from wastewater outfalls. Similarly, stratification reduces the tendency for surface contamination, such as oil spills, to mix downward into the water column. Stratification of the water column is largely dictated by vertical temperature gradients, except when freshwater plumes from storm water runoff are present.

Dissolved Oxygen

In combination with nutrients, dissolved oxygen is necessary for a healthy marine ecosystem. Pollutants high in organic constituents can locally deplete oxygen levels and deleteriously affect marine organisms. Oxygen depletion arises from the bacterial degradation of oxidizable components in organic wastes. In extreme cases, this additional oxygen demand can reduce dissolved oxygen levels to below those necessary to support biological processes. Because of this, the California Ocean Plan limits the discharge of oxygen-demanding constituents within wastewater so that the resulting depression in dissolved-oxygen concentrations does not exceed 10 percent from natural conditions (SWRCB 2005a). Anoxic conditions can occur in the water column as well as in seafloor sediments, although their occurrence in the well-flushed open ocean is rare. Nevertheless, anoxic conditions occur naturally at the water-sediment interface in many of the deep basins within the SCB (Dailey et al. 1993).

Surface waters at the Project site are usually supersaturated with oxygen because of photosynthetic activity and bubble entrainment by surface gravity waves. Saturation levels, which range from 6 to 11 percent, are largely determined by sea-surface temperature because it is the primary factor determining gaseous solubility at the air-sea interface. Below this surface maximum, dissolved-oxygen levels steadily decrease with depth due to natural losses from biotic respiration and decomposition, and from the lack of exchange with the atmosphere. Under stratified conditions during upwelling, dissolved-oxygen levels decrease rapidly with depth. The low oxygen concentrations at depth are a consequence of the shoreward movement of deep, oxygen-poor waters that have not been in recent contact with the atmosphere, and where ongoing respiration and decomposition have extracted much of the available dissolved oxygen.

Hydrogen-Ion Concentration

The pH of marine waters in the study region is similar to that of seawater in most other oceans of the world. It is slightly alkaline, with a pH ranging between 7.5 and 8.5. The lack of strong geographic variation in pH is a consequence of the well -buffered nature of the ocean's carbonate system. The highest pH levels occur in the region during spring upwelling, when increased photosynthesis consumes carbon dioxide (CO_2) and produces oxygen near the sea surface. As the ratio of respiration to photosynthesis increases with depth, there is an increase in dissolved CO_2 (carbonic acid) and a corresponding decline in pH as the waters become more acidic.

The pH of ambient seawater can also be impacted by the discharge of certain types of pollutants, particularly if the substances are caustic (pH>12), like Portland or hydraulic cement used in marine construction, or strongly acidic (pH<3). Even then, however, the well-buffered open ocean quickly moderates pH excursions, so the effects tend to be temporary and localized. Nevertheless, the California Ocean Plan restricts the discharge of pH-altering substances so they do not change the receiving seawater pH by more than 0.2 units from natural conditions.

Seawater Clarity

Water clarity, transparency, transmissivity, ambient light penetration, turbidity, and suspended-solid concentrations all reflect how well water transmits light. Turbidity decreases the clarity of seawater and can limit the penetration of ambient light in the upper reaches of the water column. It is largely determined by the concentration of suspended particulate matter and, within the upper water column, turbidity dictates the depth of the euphotic zone. The base of the euphotic zone is where ambient light intensity is reduced to roughly 1 percent of surface illumination, which is the minimum necessary for phytoplankton growth. Turbidity increases in coastal waters as a result of phytoplankton blooms, storm and freshwater runoff, sediment resuspension, and wastewater discharges from seafloor outfalls. Within the SCB, substantial particulate input from creek runoff generally occurs in the form of large isolated pulses rather than a steady discharge of terrigenous material. Rare, intense storm events occasionally punctuate the prevailing semi-arid climate. Such storms generate large amounts of turbid runoff, which results in profound but transient increases in coastal turbidity.

Anthropogenic reductions in the transmission of ambient light in the upper water column are of greatest concern because they limit the depth of the euphotic zone and thus primary production (phytoplanktonic photosynthesis) and macroalgal (kelp) growth. In recognition of this, NPDES permits restrict the volume and concentration of suspended solids contained within point-source discharges. The California Ocean Plan requires that a wastewater discharge not cause a significant reduction in the transmittance of natural light after initial mixing. However, similar controls are difficult to impose on the discharge of suspended solids within storm water runoff, dredging activities, construction activities, and natural and harmful algal blooms.

Water clarity within the Bay, as measured by annual average transmissivity at the sea surface, is relatively high. This is particularly true in the central Bay, where surface waters are capable of transmitting 85 percent of the ambient light across a 25-centimeter (cm) path. Light transmittance tapers off to 66 percent near the shoreline near where the Dockweiler sand source site is located. The reduced nearshore water clarity reflects the influence of wave-induced sediment resuspension and the influence of Ballona Creek runoff. Because these influences vary markedly over time, transmissivity also has its highest variability within this nearshore region (Nezlin et al. 2004). Water clarity is also reduced within the euphotic zone when upwelling-induced primary productivity (phytoplanktonic blooms) increases the presence of biogenic particulates. On average, the lowest water clarity is found at the end of April, when upwelling winds are typically at their maximum. When combined with increased turbidity near the seafloor from wave resuspension, a mid-depth maximum in transmissivity (water clarity) is often observed in the nearshore region. This vertical distribution differs from that of the other seawater properties, which tend to steadily increase or decrease with depth.

Nutrients

In addition to ambient light intensity, phytoplanktonic photosynthesis depends on the availability of inorganic nutrients, particularly phosphates and nitrates. Factors that influence nutrient concentrations include upwelling, biological processes, wastewater disposal, and stormwater runoff. For the most part, concentrations of nitrate, phosphate, and silicate are negligible within the euphotic zone due to rapid uptake by phytoplankton. However, sewage and surface-water runoff can contain high levels of nitrogen and phosphate, and can locally alter nutrient levels within receiving waters.

Excessive nutrient loading can lead to harmful phytoplankton (algal) blooms within surface waters and impact dissolved-oxygen levels. Within the SCB, marine impacts are primarily caused by recurring blooms of *Alexandrium* and *Pseudo-nitzschia* that produce potent neurotoxins (Schnetzer et al. 2007). These neurotoxins accumulate in fish and shellfish that are ingested by mammals, including humans, and cause paralytic and amnesic shellfish poisoning. Bioaccumulation of algal toxins through the food web has been linked to significant wildlife mortality events of fish, birds, and marine mammals, especially protected species like sea lions.

Seawater Metals, Dissolved Organic Compounds, and Bacteria

In contrast to organic contaminants, most trace metals occur in detectable concentrations within seafloor sediments, and to some degree, in a dissolved form within the water column. Low, but detectable concentrations of dissolved arsenic, copper, lead, mercury, and zinc have been found in seawater samples within the Bay. Many of these quantifiable concentrations exceeded the objectives of the California Ocean Plan but were unrelated to effluent discharge. Of the variety of sources that could be responsible for input of metals into coastal waters, municipal and industrial discharges, onshore runoff, vessel coatings, and atmospheric fallout contribute the greatest volumes (Eganhouse and Venkatesan 1993).

Sediment Physicochemistry

Sediment properties lend insight into the seafloor environment offshore Broad Beach and near the sand source sites, and help quantify potential future impacts from the Project and its alternatives. Sediment grain-size distributions reflect the integrated influence of a wide variety of oceanographic, chemical, and biological processes. For example, the shape and amplitude of the grain-size distributions record the relative strength of competing erosional and depositional processes as they vary throughout region. They also can be used to estimate the site-specific tendency for resuspension of surficial sediments and, once suspended, the rate at which they settle back to the seafloor. These properties can be used to determine the duration and spatial extent of turbidity plumes generated by Project activities.

The amount of silt and clay in seafloor sediments also directly affects the composition of the infaunal community that resides within those sediments; although the precise mechanism for the relationship is rarely clear (Snelgrove and Butman 1994). In addition, natural variation in trace-metal concentrations has been correlated with the fine-sediment fraction and, along with aluminum and iron, has been used to normalize metal concentrations to remove naturally occurring trends and reveal anthropogenic influences (Dossis and Warren 1980, Horowitz and Elrick 1987).

Benthic environments are important indicators of the presence of marine pollution because they are the principal reservoir for most contaminants that enter the ocean. Contaminants incorporated into seafloor sediments tend to have a long residence time because of the slow dispersive processes that prevail within pore waters. Infaunal organisms that live within seafloor sediments are continuously exposed to contaminants because they cannot easily escape the source of pollution. Sedentary infaunal organisms provide a food source for other more mobile organisms, such as finfish and shellfish. These trophic relationships can lead to bioaccumulation of contaminants within the marine food chain.

Physical Properties

Most of the seafloor within the region consists of unconsolidated sediment with silt and clay as the predominant size fraction from the 70-foot isobath to the basin floor (Gardiner et al*.* 2003). Sandy substrates are restricted to the innermost shelf although sand is also present on Short Bank in the center of the Bay (see Figure 3.2-3). Cobble and gravel substrates are restricted to the innermost shelf near Point Dume in the north and Palos Verdes in the south. Patches of coarse sediment are also interspersed throughout the deeper portions of the Bay, where internal bores have winnowed finer surficial sediments and exposed underlying granules that are more resistant to resuspension.

Surficial sediments in the nearshore area of Broad Beach tend to be better sorted and larger in diameter than offshore sediments due to erosion, transport of sand from terrestrial areas, and strong oscillatory flows generated by shoaling surface-gravity waves. Sediments that have experienced energetic reworking tend to be better sorted with larger median grain sizes.

Two locations have been identified as being suitable and available for use for beach sand in the Project: one site off Dockweiler Beach, and another location in the sand shoal area immediately outside Ventura Harbor. The material at these locations is slightly coarser than the existing sand at Broad Beach, so it would remain in place longer, although the fines content matches the fines composition of the dry beach (<1 percent fines).

Chemical Properties

Sediment quality near Broad Beach and at the various sand source sites is of interest because activities associated with the Project and its alternatives could potentially resuspend surficial sediments, thereby mobilizing any entrained contaminants into the water column. However, sediment-quality evaluations based on site-specific chemical properties need to distinguish between synthetic organic compounds and trace metals. In contrast to synthetic compounds, the presence of trace metals within seafloor sediments is not necessarily indicative of anthropogenic input. Most trace metals are found in detectable concentrations within naturally occurring mineral deposits, and some are even needed by marine organisms to survive. However, elevated levels of certain trace metals can be indicative of anthropogenic input, and excessive levels can cause deleterious effects in marine organisms.

Sediments within certain areas of the Bay contain elevated concentrations of both organic contaminants and trace metals. They arise because of a long history of contaminant input from the adjacent, heavily populated coastline. Municipal dischargers were formerly a major source of contamination in Bay sediments, particularly within the central and southern portions of the Bay where the Hyperion Treatment Plant Outfalls were located, and where the northward-flowing Southern California Countercurrent transported contaminants from the White Point outfall on the Palos Verdes Peninsula. However, the sources of contaminant input to the Bay have changed dramatically over the last 3 decades, principally due to improved treatment and better source control by municipal wastewater dischargers (Bay et al. 2003b).

Although bioassays conducted on subsurface sediments near current or former Hyperion wastewater outfall locations exhibited significant toxicity, surficial sediments throughout most of the Bay have not been found to be particularly toxic to marine organisms (Greenstein et al. 2003). Contaminant concentrations within these toxic subsurface sediment samples were consistent with responses predicted from sediment-quality guidelines.

The two most common guidelines for predicting biological effects from a sediment chemical are the effects-range low (ERL) concentration, below which toxic effects are not expected, and the effects-range median (ERM) concentration, above which adverse biological effects can be expected (Long and Morgan 1991, Long et al. 1995). Adverse effects are occasionally observed in sediments with chemical concentrations that lie between the ERL and ERM guidelines.

Elevated concentrations of anthropogenic metals such as lead and organic pollutants are also found on the seafloor offshore Ballona Creek (Schiff and Bay 2003). In contrast to point-source wastewater discharges, the accumulation of anthropogenic sediment contaminants offshore Ballona Creek results primarily from storm water runoff. Rainfall during winter storms produces turbid, freshwater plumes that extend 2.5 to 4.5 miles offshore, 6 miles alongshore, and may persist for 3 days (Washburn et al. 2003). Although the plumes only occupy the upper 33 feet of the water column, their depositional footprint is apparent in the seafloor sediments as increased organic and fine fractions.

The plumes usually extend northward along the coast in response to wind and Coriolis forcing. Consequently, contaminants within the depositional footprint can be discerned farther upcoast (2.5 miles) than downcoast (1.2 miles). However, the Dockweiler sand source is located only about 1 mile downcoast of the creek mouth, and sediments at the northern end of this borrow site may be periodically impacted by the outflow from Ballona Creek.

<u>Pollutant Loading</u>

Pollutants enter the Bay through river drainages, municipal and industrial wastewater discharges, dumping, air emissions, chemical spills, vessel discharges, and surface runoff. Increasing urbanization of the adjacent watershed in the early and middle part of the twentieth century imposed numerous environmental stressors on the Bay (Dojiri et al. 2003). Pollutant discharges to the Bay stabilized and began to decline after passage of the Clean Water Act in 1972. Since then, the predominant source of pollutant loading shifted from point-source wastewater discharges to non-point-source urban runoff (Lyon and Stein 2008). However, the legacy of pollutant discharge has left contamination in more than 90 percent of Bay's sediments, often at levels of potential biological concern (Schiff 2000).

Point-Source Discharges

There are 193 NPDES-permitted discharges to the Bay (LARWQCB 2007a). However, a handful of the largest dischargers contribute the vast majority of wastewater volume to the Bay, including two municipal wastewater treatment plants, three coastal power-generating stations, and Chevron's El Segundo Oil Refinery (see Table 3.2-1).

Flow rates, constituent concentrations, and mass emissions from the two large municipal wastewater treatment plants, the Hyperion Treatment Plant and the Joint Water Pollution Control Plant (JWPCP), have significantly declined since 2003, when both plants achieved full-secondary treatment. Nevertheless, they remain by far, the largest point sources of contaminant input to the Bay, mainly due to the large volumes they discharge daily. The combined discharge of contaminants to the Bay from all other known point sources, such as industrial facilities, power generating stations, offshore oil platforms, and dredge material disposals, is minor compared to these two large wastewater facilities. Minor point-source discharges are presently estimated to contribute less than two percent of total pollutants discharged into the Bay (LARWQCB 2007b). Only non-point source inputs, such as stormwater runoff, constitute a greater source of contaminants (Schiff et al. 2000).

However, this was not always the case. Legacy pollution from wastewater treatment facilities has accumulated near existing and decommissioned outfalls offshore of Palos Verdes and Playa del Rey. In particular, deposition of dichlorodiphenyltrichloroethane (DDT) and polychlorinated biphenyl (PCB) compounds on the Palos Verdes Shelf has led to the area's designation as a Superfund site, with attendant human health advisories for consumption of certain finfish species caught within a localized area.

Hyperion Treatment Plant: The Hyperion Treatment Plant is approximately 1 mile downcoast from the Dockweiler sand source site (Figure 3.2-4). Hyperion has three outfalls in the vicinity of the Dockweiler sand source: a 5-mile outfall in regular use, a 1-mile-long emergency outfall, and an abandoned 7-mile-long sludge outfall. Presently, unchlorinated, secondary treated effluent is discharged on a regular basis through the 5-mile-long outfall that terminates in a Y-shaped diffuser structure 187 feet beneath the sea surface (Figure 3.2-4). The 1-mile outfall discharges south of the 5-mile-long outfall's corridor in water 50 feet deep. Use of this outfall is permitted for the emergency discharge of chlorinated, secondary treated effluent during extremely high flows, power failures, and preventive maintenance, such as routine opening and closing of the outfall gate valves for exercise and lubrication. However, during intense storms, especially when associated with plant power outages, direct discharge of undisinfected stormwater overflow is also permitted through this outfall. Hyperion abandoned its 7-mile sludge outfall in place in 1987; its corridor extends north of the 5-mile-long outfall's corridor.

Table 3.2-1. Mass Emissions from Major Point-Source Discharges to Santa Monica Bay

	Wastewater		Power			Chevron Refinery
	Hyperion	JWPCP	Scattergood	El Segundo	Redondo	
Flow (MGD)	315	322	254	412	661	6.7
High-Emission Constituents (MT)						
BOD (5-day)	8300	2800	—	—	—	—
TSS	8900	6900	—	—	—	ND
Residual Chlorine	—	—	—	48	67	—
Ammonia Nitrogen	16000	14000	—	ND	ND	21
O&G	200	ND	—	—	—	ND
Organic Nitrogen	1686	2541	—	—	—	—
Nitrate Nitrogen	9.6	2.9	—	ND	93	—
Total Phosphorus	1282	352	—	—	—	—
Phenol	—	2.6	—	—	—	ND
Zinc	9.7	2.1	5.6	14	—	ND
Copper	9.2	2.7	ND	1.2	ND	0.019
Nickel	3.7	8.5	ND	ND	ND	0.013
Lead	1.8	ND	ND	ND	ND	ND
Chromium	0.65	ND	—	3.0	ND	ND
Cyanide	0.7	1.8	—	—	—	ND
Silver	0.62	ND	ND	ND	ND	ND
Arsenic	1.2	0.61	ND	ND	ND	0.217
Cadmium	0.08	ND	1.2	ND	ND	ND
Trace Constituents (MT)						
Selenium	0.46	3.1	ND	ND	ND	0.93
Mercury	0.003	ND	ND	ND	ND	ND
Total DDT	0.13	ND	—	—	—	ND
PCB	ND	ND	—	—	—	ND
PAH	0.023	0.0089	—	—	—	ND

Sources: Steinberger and Schiff 2003, Steinberger and Stein 2004, Lyon et al. 2006.
Notes: — = Not reported, BOD = Biochemical Oxygen Demand, MGD = Million Gallons per Day, MT = Metric Tons = 1000 kg, ND = Below detectable limits or no detectable difference between inlet and outlet samples, O&G = Oil and grease

The Hyperion Treatment Plant has been discharging to the Bay for 125 years. Throughout the first part of the twentieth century, the Plant's effluent quality declined as increases in wastewater inflow outpaced plant modifications. However, total contaminant loading to the marine environment was markedly reduced when sludge disposal was terminated in 1987, and effluent quality dramatically improved with the upgrade of the facility to full secondary treatment in 1998. As a result, emissions of all constituents, including total suspended solids (TSS), biochemical oxygen demand (BOD), metals, and organics, were reduced (Schiff et al. 2000). Since that time, increased source control and pretreatment of discharges into the collection system have further improved effluent quality

Although the Plant's wastewater volume discharged in 2003 was less than the JWPCP discharge, the concentrations of major effluent constituents were higher and resulted in the discharge of greater loads of oxygen-demanding material (BOD in Table 3.2-1), TSS, oil and grease (O&G), and ammonia.

<u>Joint Water Pollution Control Plant</u>: Discharges by the JWPCP have also affected water and sediment quality within the Bay even though its outfall at White Point does not discharge directly into the Bay. The White Point outfall is located outside of the Bay on the Palos Verdes Peninsula; however, prevailing northwestward currents carry effluent contaminants into the Bay where they have impacted seafloor sediments. For example, high levels of DDT in the southern portion of the Bay have been attributed to transport of past JWPCP discharges at White Point. As with Hyperion, the quality of the White Point effluent has improved dramatically over the last 20 years, but its long legacy of sediment contamination remains problematic (Lee and Wisberg 2002).

<u>Power Generating Facilities</u>: Three electric power-generating stations in the Bay use seawater from the Bay to cool steam condensers. The warmed seawater is then discharged back to the Bay, along with a small amount of in-plant waste. Dissolved pollutant concentrations generally remain low in this process and, while the once-through cooling requires high flow rates, emission of in-plant waste is small compared to the wastewater treatment facilities (see Table 3.2-1). Together, the Redondo Beach Generating Station, Scattergood Generating Station and El Segundo Generating Station discharged 1,300 Million Gallons per Day (MGD) of once-through cooling water in 2000, a rate four-fold higher than the Hyperion Treatment Plant. The Scattergood and El Segundo Generating Stations are located just south (approximately 1 mile) of the Dockweiler sand source site, while the Redondo Beach Generating Station is located approximately 7.5 miles to the south.

The Scattergood Steam Generating Station discharges through an outfall that extends 0.4 miles offshore, with a discharge 15 feet beneath the sea surface. The maximum allowable discharge rate is 495 MGD, with an average design flow of 324 MGD. During 2000, as in most years, it operated well below capacity. Once-through cooling water makes up 99.9 percent of the discharge, with the remaining 0.1 percent from in-plant wastewater. Cooling water pipelines are also periodically injected with liquid chlorine for 40 minutes per 8-hour work shift to control biological growth.

The El Segundo Power Generating Station operates two outfalls that discharge 0.4 mile offshore. The two power units that discharge through the northernmost outfall ceased commercial operation in January 2003, but at least one circulating water pump operates continuously to support other facility operations. The design flow through the two remaining units is 398.6 MGD. Consequently, the average annual flow rate of 412 MGD reported for 2000 in Table 3.2-1 includes a significant contribution from the partially mothballed units. Current and projected flow rates are likely to remain well below those reported in Table 3.2-1, and the associated emission of constituents is likely to be much lower as well.

The Redondo Beach Generating Station operates two outfalls as well. These closely aligned outfalls discharge 0.25 mile and 0.28 mile offshore, just outside the King Harbor Breakwater. Water depth at that location is 35 feet, although the 15-foot risers reduce the discharge depth to 20 feet. During 2000, the discharge rate through the two outfalls was equal to the combined discharge of the two other power-generating stations. Typical of other generating stations, cooling water comprises more than 99 percent of the facility's total discharge.

All three of these once-through-cooling power-generating stations introduce relatively small chemical contaminant loads to the marine environment. Nevertheless, the plants also have marine water-quality and biological impacts that are unrelated to contaminant loads. These include thermal impacts and impingement or entrainment impacts. Since 1975, however, the California Thermal Plan has regulated thermal impacts from power-plant discharges (SWRCB 1975).

<u>El Segundo Refinery</u>: The Chevron El Segundo Refinery is the only major industrial facility discharging directly to the Bay. The refinery is located 3.0 miles south of the Dockweiler sand source site. The influent to the Terminal's treatment facility includes petroleum-processing wastewater, boiler water, shallow recovery-well groundwater, and stormwater runoff.

As with the power plants, the Refinery normally emits only small contaminant loads compared to the other major point-source dischargers in the Bay (see Table 3.2-1). In contrast to other major point sources in the region, the Refinery's wastewater characteristics vary over time due to changes in the mix of source water. Usually, wastewater generated by the Refinery process constitutes the vast majority of the daily flow. Often, however, the process water is comingled with wastewater from other sources, such as treated wastewater extracted as part of an extensive remediation project of hydrocarbon-contaminated groundwater that lies beneath the Refinery.

In addition, effluent occasionally includes a large volume of stormwater runoff. For example, an upset in the Refinery's effluent diversion system during a major rainstorm in January 1998 allowed stormwater to enter an overflow collection basin whose outlet trough contained free oil. The discharge generated visible oil sheen on the sea surface for 14 days.

Non-Point-Source Discharges

During major storm events, non-point discharges are the primary source of pollutant loading to the SCB. This is because associated improvements in treatment since the 1972 passage of Federal Water Pollution Control Amendments resulted in profound decreases in point-source contaminant emissions to the SCB (Lyon and Stein 2008). Although the SCB's coastal population grew by 56 percent and point-source discharge volumes increased by 31 percent between 1971 and 2000, mass emission of most effluent constituents actually decreased by more than 65 percent. As point-source treatment has improved, the relative contribution of contaminants from non-point sources has increased.

<u>Freshwater Runoff</u>: Watersheds are the basic geographic unit within which non-point sources of pollution and sedimentation can be addressed. Within the city of Malibu these sources of water quality contamination are primarily associated with upstream discharge of treated effluent from lands inland of the City and stormwater conveyance of fertilizers, manure, petroleum products (i.e., gasoline, oil, other lubricants), chemicals from car exhaust, livestock (i.e., horses), commercial discharges, sedimentation and dispersed contributions of pathogens from local septic systems. Much of the chemical contamination is originally derived from the surfaces of pavement and other forms of hardscape, while increased sediment loads are associated with grading, excavation, and other forms of vegetation disturbance, i.e., fires, grazing, agricultural practices, and vegetation removal for fire and flood control (MGP 1995).

The city of Malibu is a semi-rural community with no centralized wastewater treatment system. The majority of homes and business in the community rely upon onsite wastewater treatment systems (OWTS) for disposal of sewage effluent. Such OWTS typically include septic systems, but also other types of systems such as drywells and more advanced systems such as aerobic treatment units (ATUs), or “package plants.” The use of OWTS for a relatively large number of homes and businesses proximate to the Pacific Ocean and local creeks and estuaries has raised concerns from citizen groups such as Heal the Bay over potential water quality impacts associated with current wastewater disposal practices. Such concerns have spurred regulatory action by the State Water Resources Control Board (SWRCB) and Regional Water Quality Control Board (RWQCB) to phase out OWTS in some areas of the community. For example, the city of Malibu is working with interested organizations and the State to address such concerns through pursuing construction of an area-wide wastewater collection treatment system in the Malibu Civic Center.

Wastewater disposal along the 1.5-mile-long reach of Broad Beach Road is provided by a mix of public and private wastewater disposal systems (refer to Figure 3.12-1). Wastewater from residences along Broad Beach west of Lechuza Point is collected through a public sewer line located beneath Broad Beach Road and treated at the Los Angeles County Department of Public Works (LACDPW)-operated Trancas Water Pollution Control Plant located across Pacific Coast Highway 0.5 mile north of the Project area, while, wastewater from residences located east of Lechuza Point is treated by individual private OWTS.

A number of publicly owned drains and private (stormwater) drains currently daylight onto Broad Beach. Unusually, the storm-drain systems that feed into the Bay are independent of the sewer collection systems. Consequently, untreated urban runoff flows directly into the Bay at freshwater outlets that have been found to contribute high levels of bacterial contamination (Noble et al. 2003, Stein and Tiefenthaler 2005). Stormwater runoff also affects the physical stratification and circulation of Bay waters, as well as the distribution and concentration of nutrients, suspended sediments, phytoplankton, pollutants, and pathogens (Washburn et al. 2003).

More than 95 percent of the annual runoff volume to the Bay is discharged during major rainstorms, mostly between late fall and early spring (Schiff et al. 2000). Not surprisingly, pollutant and bacteria concentrations in the Bay are highest during the first months of the rainy season when initial rainfall events flush contaminants that have accumulated onshore during long dry spells.

One of the most apparent impacts from stormwater runoff is the temporary closure of beaches when seawater samples exceed bacterial standards. Whereas 96 percent of the SCB shoreline meets water-quality standards during dry weather, less than 40 percent of shoreline samples meet the bacterial standards during wet weather (Noble et al. 2003). Additionally, areas near storm drains have a disproportionately high incidence of bacterial contamination compared to other shoreline areas.

Repeated closures of Marina del Rey beaches are related to their proximity to the mouth of Ballona Creek, a known source of contaminants (Bay et al. 2003a). Of the two large watersheds that drain into the Bay, the Ballona Creek watershed is the largest (see Figure 3.2-2). It drains a 130-square-mile area that is 83 percent developed. Although the Malibu Creek watershed is almost as large, it drains a largely natural landscape with only 4 percent impermeable surface area. As a result, Malibu Creek outflow is rarely toxic to marine organisms, whereas the drainage from Ballona Creek can be toxic as far away as 2.5 miles from its mouth (Schiff and Bay 2003).

In 2002, Ballona Creek was listed as an impaired water body that flows into a marine protected area, namely, Santa Monica Bay. Waters within Ballona Creek have detectable levels of arsenic, cadmium, chromium, copper, nickel, zinc, and lead with concentrations of cadmium, copper, nickel, zinc, and lead exceeding State water-quality criteria at least occasionally (Stein and Tiefenthaler 2005). The Ballona Creek watershed is also considered impaired because of coliform, trash, PCB, and legacy pesticides, such as DDT, chlordane, and dieldrin. As a result of these pollutant loads, sediments within the Marina del Rey Entrance Channel and the Ballona Creek mouth have elevated concentrations of DDT, PCB, copper, mercury, nickel, lead, zinc and chlordane, dieldrin, and chlorpyrifos, and they are toxic to aquatic organisms.

Although changes in sediment texture, organic content, and increased sediment contamination are also evident farther offshore of Ballona Creek, stormwater discharges have not perceptibly degraded the resident benthic community. The community has abundance, species richness, biodiversity, and benthic response index similar to shallow water areas distant from creek mouths throughout the SCB. There is neither a preponderance of pollution-tolerant species, nor a lack of pollution-sensitive species, offshore of either the Malibu or Ballona creek mouths.

<u>Other Non-Point Sources</u>: Contaminants also enter the Bay through atmospheric deposition and from its two marinas, Marina del Rey and King Harbor. Marinas can be a significant source of O&G, debris, copper-containing antifouling bottom paints for boats, mercury, arsenic, zinc, chromium, lead, and tributyltin. Aerial deposition is an important source of lead, nickel, zinc, mercury, and polycyclic aromatic hydrocarbons (PAHs).

Atmospheric and oceanographic measurements analyzed in support of the Santa Monica Bay Restoration Plan found that aerial deposition is a significant contributor to the overall pollutant load to the Bay, especially trace metals such as lead, chromium, and zinc (Stolzenbach et al. 2001, Lu et al. 2003). On an annual basis, daily dry deposition of metals onto the Bay's sea surface and watershed far exceed the amounts deposited during rain events. Chronic daily dry deposition is also far greater than cumulative deposition during Santa Ana conditions, when a large volume of polluted air is blown offshore from the Los Angeles Basin. Most of the mass of metals deposited by dry deposition originates as relatively large aerosols (>10 μm) generated by widespread area sources such as off-road vehicles, including boats, planes, and construction vehicles within the watershed.

3.2.2 Regulations Pertaining to the Public Trust

Federal, State, and local plans and policies regulate water quality in the region surrounding the Project area. The Bay was included in the National Estuary Program in 1989, recognizing its national importance. A watershed plan was developed in 1995 and the Santa Monica Bay Watershed Commission was established in 2004 to oversee implementation of the Plan. Despite its relatively small size compared to watersheds in other parts of the country, the Santa Monica Bay Watershed includes diverse geological and hydrological characteristics, habitat features, and human activities. Consequently, every beneficial use defined in the Los Angeles Regional Basin Plan, except preservation of biological habitats, has been identified in one or more of the water bodies within the watershed (LARWQCB 2007a). Although many of these beneficial uses have been impaired for years, some of the impaired areas show signs of recovery.

<u>Federal</u>

Clean Water Act

The Federal Clean Water Act (33 U.S.C. 1251 et seq.) (as amended) provides for delegation of certain responsibilities in water-quality control and water-quality planning to the states. In California, the Environmental Protection Agency (EPA) and the California SWRCB have agreed to such delegation and regional boards implement portions of the Clean Water Act, such as the NPDES program. The aim of the Clean Water Act of 1977 is to restore and maintain the chemical, physical, and biological integrity of the nation's waters.

The Federal Clean Water Act requires that any point-source discharges of pollutants to United States (U.S.) water must conform with an NPDES permit. NPDES permits establish effluent limitations that incorporate various requirements of the Clean Water Act designed to protect water quality.

Section 303(d)

Section 303(d) of the Clean Water Act requires states to identify specific water bodies where water-quality standards are not expected to be met after implementation of effluent limitations on point sources. For all 303(d)-listed water bodies and pollutants, pollutant-loading limits for point and non-point sources must be developed and adopted. The EPA approved the State’s 303(d) list of impaired water bodies on July 25, 2003, which included the following pollutant impairments of Trancas Beach (Broad Beach): fish consumption advisories for DDT and PCBs, elevated coliform density, and beach closures. Similarly, impairments at nearby Zuma Beach (Westward Beach) included fish consumption advisories for DDT and PCBs, and beach closures. Meanwhile, the nearshore and offshore waters throughout the Bay were listed as impaired by DDT and PCBs in tissue and sediment, PAHs in sediment, chlordane, elevated coliform density, debris, sediment toxicity, fish consumption advisories, and beach closures.

Vessel General Permit

On December 18, 2008, the EPA finalized an NPDES Vessel General Permit for discharges incidental to normal vessel operations (USEPA 2008). It requires U.S. and foreign-flagged commercial vessels longer than 79 feet and operating in U.S. waters to comply with a range of best management, inspection, monitoring, reporting, and recordkeeping practices for virtually every water-based waste stream generated by a ship, including ballast-water discharges. It regulates the discharge of aquatic nuisance species, nutrients, pathogens, oil and gas, metals, BOD, pH TSS, and other toxic and non-conventional pollutants with toxic effects. As a general permit, all eligible vessels are automatically authorized to discharge pursuant to the permit, but vessels greater than 300 tons, or having the capacity to hold or discharge more than 2,113 gallons of ballast water, must submit a Notice of Intent to the EPA within 9 months of permit finalization to continue discharging.

The Vessel General Permit's best management practices (BMPs) for ballast water include: restricting discharges to only those essential to the operation of the vessel; removal of sediment from ballast tanks in mid-ocean or at dry-dock; avoiding ballast-water uptake in areas of known pathogens; conducting mid-ocean ballast exchanges; and retaining all ballast water on board while in U.S. waters. Marine releases of ballast water, deck washdown, or vessel runoff with total hydrocarbon concentrations exceeding 15 parts per million (ppm) is prohibited.

Coastal Zone Management Act

The Coastal Zone Management Act of 1972, which was last amended in 1996 through the Coastal Zone Protection Act, regulates development and use of the nation's coastal zone by encouraging states to develop and implement coastal zone management programs. Coastal Zone Management Act regulations are recorded in 15 CFR 923 through 930. The roles of long-range planning and management of California's coastal zone were conferred to the State with implementation of the California Coastal Act (Coastal Act) in 1976, which was last amended on January 1, 2005. California Coastal Commission (CCC) administrative regulations are recorded in 14 CCR (Division 5).

State

California Coastal Act

The Coastal Act became law in 1976 to provide a comprehensive framework to protect and manage coastal resources. The main goals of the Coastal Act are to protect and restore coastal zone resources, to ensure balanced and orderly utilization of such resources, to maximize public access to and along the coast, to ensure priority for coastal dependent and coastal-related development, and to encourage cooperation between State and local agencies toward achieving the Coastal Act's objectives. This includes development and implementation by local governments of Local Coastal Programs (LCPs) that are consistent with the aims and goals of the Coastal Act, and certified by the CCC. The Act's water-quality provisions would apply to the installation of new moorings, which are proposed as an alternative to the Project and would require a coastal development permit.

The Coastal Act contains policies to guide local and State decision-makers in the management of coastal and marine resources. The Coastal Act identifies protective measures for nearshore marine resources. Several provisions of the Coastal Act serve to protect coastal water quality from point and nonpoint source pollution.

Coastal Act Section 30231 states:

> *The biological productivity and the quality of coastal waters, streams, wetlands, estuaries, and lakes appropriate to maintain optimum populations of marine organisms and for the protection of human health shall be maintained and, where feasible, restored through, among other means, minimizing adverse effects of waste water discharges and entrainment, controlling runoff, preventing depletion of ground water supplies and substantial interference with surface water flow, encouraging waste water reclamation, maintaining natural vegetation buffer areas that protect riparian habitats, and minimizing alteration of natural streams.*

Coastal Act Section 30232 states:

> *Protection against the spillage of crude oil, gas, petroleum products, or hazardous substances shall be provided in relation to any development or transportation of such materials. Effective containment and cleanup facilities and procedures shall be provided for accidental spills that do occur.*

Coastal Act Section 30235 states:

> *Revetments, breakwaters, groins, harbor channels, seawalls, cliff retaining walls, and other such construction that alters natural shoreline processes shall be*

> *permitted when required to serve coastal-dependent uses or to protect existing structures or public beaches in danger from erosion, and when designed to eliminate or mitigate adverse impacts on local shoreline sand supply. Existing marine structures causing water stagnation contributing to pollution problems and fishkills should be phased out or upgraded where feasible.*

California Water Code

Section 13142.5 of the California Water Code provides marine water-quality policies stating that wastewater discharges shall be treated to protect present and future beneficial uses and, where feasible, to restore past beneficial uses of the receiving waters. The highest priority is given to improving or eliminating discharges that adversely affect wetlands, estuaries, and other biologically sensitive sites; areas important for water contact sports; areas that produce shellfish for human consumption; and ocean areas subject to massive waste discharge.

Porter-Cologne Water Quality Control Act

Since 1973, the California SWRCB and its nine Regional Water Quality Control Boards have been delegated responsibility for administering permitted discharge into the coastal marine waters of California. The Porter-Cologne Water Quality Act (Porter-Cologne) provided a comprehensive water-quality management system for the protection of California waters and regulated the discharge of oil into navigable waters by imposing civil penalties and damages for negligent or intentional oil spills. Under Porter Cologne, any person discharging waste, or proposing to discharge waste, within any region that could affect the quality of the waters of the State must report the discharge to the appropriate regional board. Pursuant to Porter Cologne, the regional board may then prescribe “waste discharge requirements” that add conditions related to control of the discharge. Porter-Cologne defines “waste” broadly, and the term has been applied to an array of materials, including non-point source pollution. When regulating discharges that are included in the Federal Clean Water Act, the State essentially treats waste-discharge requirements and NPDES as a single permitting vehicle. In April 1991, the SWRCB and other State environmental agencies were incorporated into the California EPA.

The Project does not involve any discharges to onshore surface waters and, therefore, likely does not require a Section 401 Water Quality Certification. However, the regional boards regulate urban runoff discharges under the NPDES permit regulations. NPDES permitting requirements include runoff discharged from point (e.g., industrial outfall discharges) and non-point (e.g., stormwater runoff) sources. The regional boards implement the NPDES program by issuing construction and industrial discharge permits.

BMPs are required as part of a Storm Water Pollution Prevention Plan. The California EPA defines BMPs as "schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of Waters of the U.S. BMPs include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage" (40 CFR 122.2).

California Harbors and Navigation Code

Discharges from vessels within territorial waters are regulated by the California Harbors and Navigation Code. One of its purposes is to prevent vessel discharges from adversely affecting the marine environment.

California Marine Invasive Species Act and California Clean Coast Act

The CSLC manages the Marine Invasive Species Program to prevent the release of nonindigenous species from commercial vessels in California waters. The program began in 1999 with the passage of California Assembly Bill 703, which codified Ballast Water Management for Control of Non-Indigenous Species under Division 36 of the Public Resources Code. The assembly bill addressed the threat of species introduced by ballast-water discharges well before Federal regulations were codified in the EPA's 2008 Vessel General Permit. This bill was repealed on January 1, 2004, and replaced with California's Marine Invasive Species Act. The Marine Invasive Species Act reauthorized and expanded the 1999 act, and all aspects of this act have become mandatory for qualified voyages within California waters. Subsequent amendments and additional legislation have expanded the scope of the program to include research, management, and policy development related to vessel fouling and ballast water treatment technologies.

One such amendment was the California Clean Coast Act of 2005 that extended California's existing program for regulating onboard incineration and the release of grey water, sewage, sewage sludge, oily bilge water, and hazardous and other waste to cover all ocean-going ships. All ships calling on California ports in 2006 were required to submit information to the CSLC on their wastewater management capabilities, ports of call, and crew requirements. The submittal was required only once for each vessel.

One of the most comprehensive pieces of legislation relating to ballast-water management was the Coastal Ecosystems Protection Act of 2006.

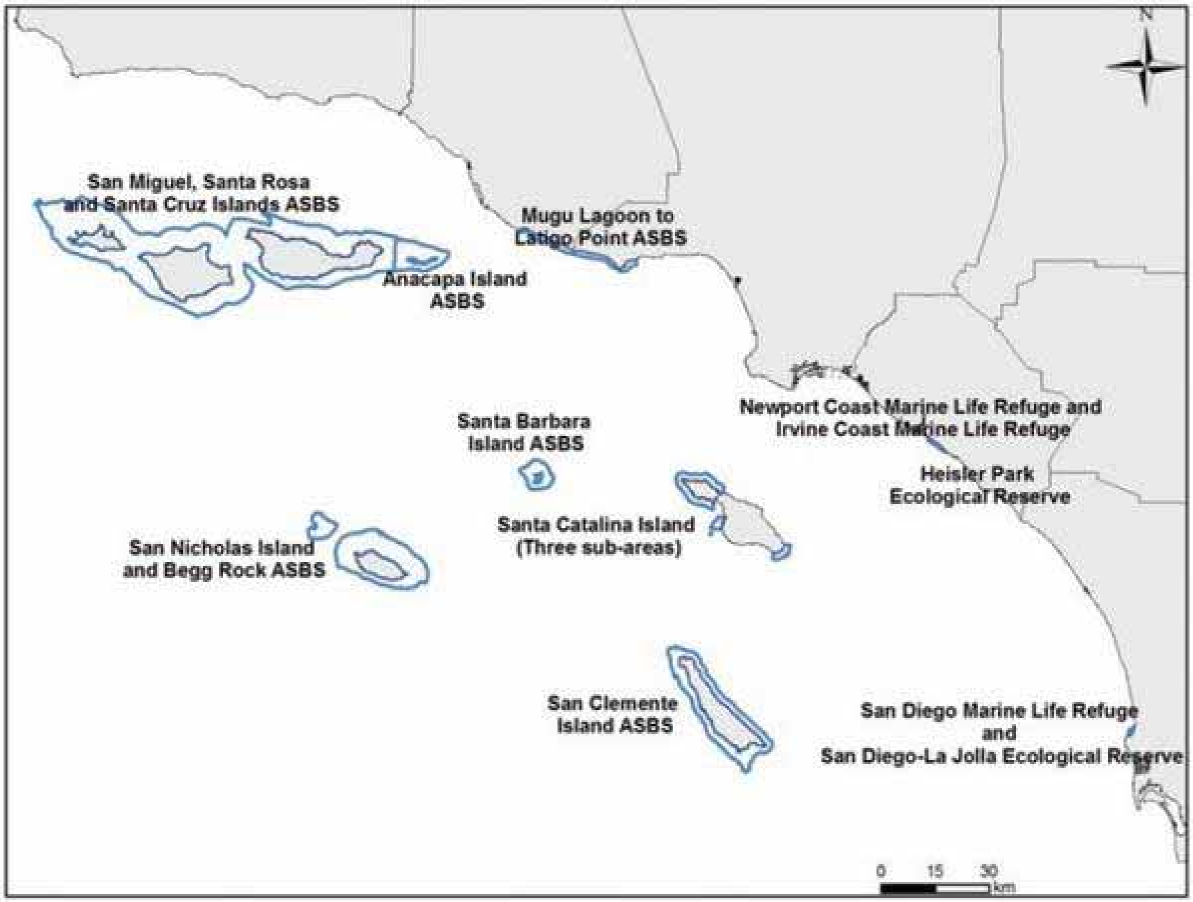
California Ocean Plan

The Water Quality Control Plan for Ocean Waters of California (Ocean Plan) applies to point and non-point sources of waste discharge into the ocean, but it does not apply to vessel wastes or to the control of dredge-material disposal or discharge. Nonetheless, the Ocean Plan, and other regulatory vehicles that establish water-quality standards for specific discharges or situations, provides numerical and narrative guidance for the criteria used to evaluate the significance of a wider range potential impacts that may arise from the Project and its alternatives. The SWRCB adopted the latest Ocean Plan amendment on April 21, 2005, which became effective on February 14, 2006 (SWRCB 2005a). The Ocean Plan specifies water-quality objectives and establishes a program of implementation to protect the State's ocean waters. The Ocean Plan also identifies specific beneficial uses, water-quality objectives, effluent limitations, and monitoring program requirements.

The Ocean Plan also regulates areas of special biological significance (ASBS), which are a subset of the State water-quality protection areas. The SWRCB designates State water-quality protection areas to protect marine species or biological communities from undesirable alterations in natural water quality. They constitute one of six categories of managed areas described in the Marine Managed Areas Improvement Act. Other categories include State marine reserves, State marine parks, State marine conservation areas, State marine cultural preservation areas, and State marine recreational management areas. The Ocean Plan designates ASBS, which presently coincide with the State water-quality protection areas. These areas are considered intrinsically valuable or have recognized value to humanity for scientific study, commercial use, recreational use, or esthetic reasons. They have the potential to benefit from protection beyond that offered by standard waste discharge requirements and other measures. Broad Beach is located within the Mugu Lagoon to Latigo Point ASBS, which extends along 24 miles of coastline (Figure 3.2-5).

Critical coastal areas designated by the CCC often overlap with ASBS. However, the protection goals of critical coastal areas differ and are directed at improving degraded water quality and providing extra protection from non-point-source pollution to marine areas with recognized high resource value. Consequently, critical coastal areas include "impaired water bodies" identified in the Section 303(d) list, as well as marine managed areas, wildlife refuges, waterfront parks, and beaches. There are several critical coastal areas along the Bay's coastline: Ballona Creek; Santa Monica Canyon, Topanga Canyon Creek, Malibu Creek, and the coastal area west of Latigo Point, corresponding to ASBS Number 24.

Figure 3.2-5.
Areas of Special Biological Significance within Southern California



Source: SCCWRP 2004

California Toxics Rule

In 2000, the EPA promulgated numeric water-quality criteria for priority toxic pollutants and other water-quality standards provisions to be applied to inland surface waters, enclosed bays, and estuaries within the State of California. These federally promulgated criteria, together with State-adopted designated uses, created water-quality standards for California inland waters. The rule satisfies Clean Water Act requirements and fulfills the need for water-quality standards for priority toxic pollutants to protect public health and the environment. The SWRCB adopted a policy for implementing these standards that includes special provisions for certain types of discharges and factors that could affect the application of other provisions of the California Toxics Rule (SWRCB 2005b).

Local

The City of Malibu Local Coastal Program

The city of Malibu has a LCP that has been certified by the CCC as being consistent with the goals and directives of the Coastal Act. This LCP allows the local governments to directly apply the development, conservation, environmental, and public access protection goals of the Coastal Act to development within their jurisdictions.

The Land Use Plan within the Malibu LCP identifies water quality policies applicable to watershed planning, development, hydro-modification, and wastewater and On-site treatment systems. The LCP states that the city will support and participate in watershed-based planning efforts within the county of Los Angeles and the RWQCB.

Specific LCP policies related to water and sediment quality are presented below:

> *Policy 3.12 No development shall be allowed in wetlands unless it is authorized under Policy 3.89. For all ESHA other than wetlands, the allowable development area (including the building pad and all graded slopes, if any, as well any permitted structures) on parcels where all feasible building sites are ESHA or ESHA buffer shall be 10,000 square feet or 25 percent of the parcel size, whichever is less. If it is demonstrated that it is not feasible from an engineering standpoint to include all graded slopes within the approved development area, then graded slope areas may be excluded from the approved development area. For parcels over 40 acres in size, the maximum development area may be increased by 500 sq. ft. for each additional acre in parcel size to a maximum of 43,560-sq. ft. (1-acre) in size. The development must be sited to avoid destruction of riparian habitat to the maximum extent feasible. These development areas shall be reduced, or no development shall be allowed, if necessary to avoid a nuisance, as defined in California Civil Code Section 3479. Mitigation of adverse impacts to ESHA that cannot be avoided through the implementation of siting and design alternatives shall be required.*

> *Policy 3.47: Earthmoving during the rainy season (extending from November 1 to March 1) shall be prohibited for development that is 1) located within or adjacent to ESHA, or 2) that includes grading on slopes greater than 4:1. In such cases, approved grading shall not be undertaken unless there is sufficient time to complete grading operations before the rainy season. If grading operations are not completed before the rainy season begins, grading shall be halted and temporary erosion control measures shall be put into place to minimize erosion until grading resumes after March 1, unless the city determines that completion of grading would be more protective of resources.*

Policy 3.75: Marine ESHAs shall be protected against significant disruption of habitat values, and only uses dependent on such resources shall be allowed within such areas. Residential, commercial, or institutional uses shall not be considered resource dependent uses.

Policy 3.82: Near shore shallow fish habitats and shore fishing areas shall be preserved, and where appropriate and feasible, enhanced.

Policy 4.37: Shoreline and bluff protection structures shall not be permitted to protect new development, except when necessary to protect a new septic system and there is no feasible alternative that would allow residential development on the parcel. Septic systems shall be located as far landward as feasible. Shoreline and bluff protection structures may be permitted to protect existing structures that were legally constructed prior to the effective date of the California Coastal Act, or that were permitted prior to certification of the LCP provided that the CDP did not contain a waiver of the right to a future shoreline or bluff protection structure and only when it can be demonstrated that said existing structures are at risk from identified hazards, that the proposed protective device is the least environmentally damaging alternative and is designed to eliminate or mitigate adverse impacts to local shoreline sand supply. Alternatives analysis shall include the relocation of existing development landward as well as the removal of portions of existing development. "Existing development" for purposes of this policy shall consist only of a principle structure, e.g. residential dwelling, required garage, or second residential unit, and shall not include accessory or ancillary structures such as decks, patios, pools, tennis courts, cabanas, stairs, landscaping, etc.

Los Angeles Water Quality Control Plan

The Los Angeles Water Quality Control Plan (LARWQCB) established the Water Quality Control Plan (Basin Plan) for the coastal watersheds of Los Angeles and Ventura Counties under the requirements of the 1969 Porter-Cologne Water Quality Control Act (LARWQCB 2007a). The Basin Plan designates specific beneficial uses for onshore surface water and offshore seawater within individual areas of the basin. The Basin Plan also sets water-quality objectives, subject to approval by the EPA, intended to protect those beneficial uses. The water-quality objectives in the Basin Plan are written to apply to specific parameters (numeric objectives) and general characteristics of the water body (narrative objectives). An example of a narrative objective in the Basin Plan is the requirement that all waters must remain free of toxic substances in concentrations producing deleterious effects upon aquatic organisms. Numeric objectives specify concentrations of individual pollutants not to be exceeded in the ambient waters of the basin. The water-quality objectives are achieved primarily through effluent limitations embodied in the NPDES program.

Santa Monica Bay Restoration Plan

In December 1988, California and the EPA designated the Bay as a nationally significant estuary and established the Santa Monica Bay National Estuary Program to recognize the need to restore and protect the Bay and its resources. The program's coalition of governments, environmentalists, scientists, industry, and the public was charged with developing and implementing a Comprehensive Conservation Management Plan for Bay protection and management. The resulting Bay Restoration Plan was approved by the Governor in December 1994 and by the EPA in 1995. The Plan's goal, to reduce pollutant loadings to the Bay from point and non-point sources, was designed to prevent degradation of the marine ecosystem, protect beaches, and minimize risks to human health. The Plan identified key problems and recommended actions to mitigate them. The Santa Monica Bay Restoration Project was established to facilitate and oversee the Plan's implementation. In 2003, the project formally became the Santa Monica Bay Restoration Commission, an independent non-regulatory State agency charged with implementing the nearly 250 actions identified in the plan that target critical problems such as polluted urban runoff, degraded wetlands, and risks to public health associated with seafood consumption and swimming near storm-drain outlets.

3.2.3 Public Trust Impact Criteria

This section describes criteria for evaluating the significance of Project-related activities or incidents that may result in impacts to marine water resources. In general, the persistence, extent, and amplitude of such impacts dictate their significance. Although the thresholds of significance for water-quality impacts are based on quantitative limits promulgated in existing standards, guidelines, and permits, interpretation of unacceptable changes in seawater or sediment conditions often require some judgment. For example, standards contained in a particular permit may be outdated, or a discharge may be causing previously unrecognized water-quality impacts. In other instances, perceived impacts may be a statistical artifact, for example, from a naturally occurring outlier in the distribution of ambient conditions. Thus, the significance of potential project-related changes in seawater properties must be gauged against the backdrop of naturally occurring variability within the SCB.

Based on these considerations, sediment and water-quality impacts would be considered significant if any of the following conditions were to occur as a result of the Project:

- Discharges that create pollution, contamination, or nuisances as defined in Section 13050 of the California Water Code;
- Release of toxic substances that would be deleterious to humans, fish, bird, or plant life;
- Measurable increases in contaminant concentrations compared to background concentrations within National Marine Sanctuaries, Marine Protected Areas, ASBS, Critical Coastal Areas, or Environmentally Sensitive Habitat Areas (ESHAs), such as coastal wetlands and kelp beds;
- Creation of a visible oil sheen on the surface of the receiving waters or marine release of fluids contaminated with oil and grease exceeding 15 ppm;
- Exposure of aquatic organisms to dissolved aromatic-hydrocarbon concentrations exceeding one part-per-billion (ppb) for periods longer than six hours (6 ppb-hour);
- Exceedance of water-quality objectives identified in the California Toxics Rule (SWRCB 2005b), the California Ocean Plan (SWRCB 2005a), or the Basin Plan (LARWQCB 2007a); and
- Exceedance of discharge limits specified in NPDES discharge permits, including the Vessel General Permit Requirements (USEPA 2008, LARWQCB 2006).

3.2.4 Public Trust Impact Analysis and Lease Conditions

The Project could adversely impact marine water and sediment quality. Dredging the sand sources at Ventura Harbor, Dockweiler, and Trancas and placement of sand on Broad Beach would directly affect turbidity of the waters overlying public trust lands in these areas. Additionally, the quality of the existing emergency revetment construction may not be adequate to protect septic systems from future damage with adverse impacts on marine waters.

Impact MWSQ-1: Revetment Retention Impacts to Turbidity of Area Waters

Retention of the revetment would continue armoring of the coastline and may increase turbidity in nearshore waters (Unsubstantial with Implementation of Avoidance and Minimization Measures, Class UI).

Impact Discussion

As part of the long term strategy for protection of private property, including homes and septic systems, from coastal erosion, the emergency revetment placed in 2010 would be buried beneath a new system of sand dunes in the landward edge of the widened, nourished beach. This shore protection would remain buried unless severe beach erosion or other conditions preclude maintaining sufficient beach width for protection.

Following the initial replenishment, the beach profile is projected to erode over 5 to 10 years, which would then trigger the proposed one-time additional nourishment. This renourishment is projected to extend the lifetime of the beach and dunes system to approximately 10 to 20 years, when the revetment would again become exposed.

Retention of the revetment would eventually result in significant impacts to water quality and sediment transport within designated sensitive water bodies such as the ASBS when the revetment becomes exposed as it is now. Placement of hard structures such as rock revetments along the coast increases turbidity in nearshore waters and disrupts the natural transport of sediments along the coast. Therefore, retention of the revetment would have significant impacts on marine water quality.

Avoidance and Minimization Measures

Implementation of Avoidance and Minimization Measures (AMMs) TBIO-1a, REC-5a, REC-5b, and REC-5c would address this impact and would reduce it to unsubstantial. AMM TBIO-1a requires implementation of a Comprehensive Dune Restoration Plan. AMM REC-5a requires additional nourishment if needed to maintain the public benefit and habitat value of the widened beach and restored dune.

AMM REC-5b requires Financial Surety for Revetment Removal. AMM REC-5c requires that Sea Level Rise Effects be analyzed during the life of the Project and that where changes in property boundaries occur that result in additional public trust lands being impeded from public use in the Project area, the CSLC shall determine appropriate Project measures to ensure no net loss of public trust lands available for public use in the Project area.

Rationale for Avoidance and Minimization Measures

Implementation of the cited AMMs would reduce impacts to local turbidity related to the revetment by ensuring that the revetment would remain buried or would be removed and would eliminate the potential for revetment exposure to wave action.

Impact MWSQ-2: Beach Nourishment and Backpassing Impacts to Trancas Lagoon

Beach nourishment and construction activities would occur near the mouth of Trancas Creek potentially affecting tidal exchange and the natural functioning of Trancas Lagoon (Unsubstantial with Implementation of Avoidance and Minimization Measures, Class UI).

Impact Discussion

The Project's beach nourishment footprint would narrow at the east end of Broad Beach, just short of the mouth of Trancas Creek where it forms Trancas Lagoon. The mouth of the creek is often blocked by a sand berm, which prevents tidal exchange and causes the creek water to pond during seasonal high flows. At certain times of the year, the lagoon may even extend eastward down the beach for several hundred feet (Figure 3.2-6).

Figure 3.2-6. Trancas Creek and Lagoon

Trancas Lagoon. Clockwise from upper left: Aerial view from in front of lagoon showing sand barrier; Ground view from mouth of creek showing lagoon from behind; Ground view of lagoon showing extension of water to the east; Aerial view of lagoon showing extension of water to the east.

The beach nourishment would result in incremental widening of the beach westward to generally coincide with the western boundary of the lagoon. Overtopping of the beach by impounded lagoon water or by high tides and wave action causes barrier breaching. The addition of significant amounts of new sand to this system may incrementally increase periods between episodic breaching as part of natural lagoon processes. Thus, the frequency and duration of lagoon breeching may be slightly altered by the Project.

However, these changes are not anticipated to be substantial or to lead to any major changes in lagoon water quality as the system is well adapted to such closures which are a natural part of this ecosystem.

Dredged material would be placed inside a three-sided containment dike, allowing excess water to drain off into the ocean while the sand material is retained within the dike. At no time would the drainage pipes be located near the mouth of Trancas Creek.

However, during both nourishment and construction, earthmoving equipment would be staged at Zuma Beach Parking Lot and would need to cross the beach area below the creek mouth to access the project site. Equipment anticipated to be crossing the area includes two bulldozers, a crane and front end loaders. In the event that the creek was breached during construction operations, or when the lagoon has extended eastward along the beach as shown in Figure 3.2-6, construction impacts could impede or divert tidal exchange associated with the creek or result in construction impacts to the lagoon waters that would impact nearshore marine water quality.

Nevertheless, the construction impacts from the Project are expected to be temporary, and with implementation of the AMMs would not significantly interfere with the natural functioning of the creek or lagoon resulting in an unsubstantial impact.

Avoidance and Minimization Measures

In addition to the AMM described below, AMMs TBIO-4a and TBIO-4b would apply and would reduce impacts from construction activities near Trancas Creek and Lagoon. AMM TBIO-4a requires an Emergency Action Plan (EAP) for protection of biological resources from hazardous spills or activities to be submitted before initiating offshore dredging or sand deposition activities. AMM TBIO-4b requires that equipment be properly maintained and requires response provisions for accidental spills. Further, AMM TBIO-5a would apply and would reduce ongoing impacts to the function of Trancas Creek and Lagoon from nourishment and backpassing.

AMM MWSQ-2a: Construction Limitations. In the event that the Trancas Lagoon mouth is breached during the initial construction period or at any time during backpassing operations, the Geologic Hazard Abatement District (GHAD) will halt construction during high flow episodes where the body of construction equipment would come in contact with flow into or out of the Lagoon.

Rationale for Avoidance and Minimization Measures

The cited AMMs would reduce impacts to water quality of Trancas Lagoon by restricting the types and timing of activity near Trancas Lagoon. A potential impact would remain to Trancas Lagoon from Project construction activities after implementation of AMMs; however, application of the AMMs would be an unsubstantial impact.

Impact MWSQ-3: Dredging and Nourishment Impacts to Marine Water and Sediment Quality

Dredging and nourishment (including backpassing) would potentially increase the turbidity of project area waters and result in the resuspension of contaminated sediments (Unsubstantial with Implementation of Avoidance and Minimization Measures, Class UI).

<u>Impact Discussion</u>

More than 90 percent of the surficial sediments within the Bay contain contaminants deposited by point-source discharges over the last century. These legacy pollutants are largely DDT and PCB, although metals, other pesticides, and hydrocarbons also have low water-solubility that causes them to adhere to particulate matter and eventually settle to the bottom of the Bay.

The Project's offshore activities could disrupt the Bay's sediments, thereby dispersing contaminants within the water column and increasing their bioavailability. Even if the resuspended sediments are not contaminated, they could temporarily increase water-column turbidity and reduce the penetration of ambient light, resulting in a possible exception to the Ocean Plan's narrative objective for water clarity. However, NPDES monitoring of seafloor sediments near to the Dockweiler sand source indicates that the sediments are largely uncontaminated compared to other areas of the Bay, and that their physical properties would result in only temporary and localized turbidity increases (refer also to Section 3.11, *Public Health and Safety Hazards*).

Dredging-related turbidity increases from the Project activities would be localized and temporary. Because seafloor sediments within the source sites consist of well-sorted sands, nearly all suspended particulates would settle out of the water column rapidly, and any initial turbidity increase would become imperceptible long before the last sediment particle settles on the seafloor. This is especially true because the transport is likely to parallel the shoreline, where ambient seawater clarity is naturally lower and far more variable than in the center of the Bay (see Figure 3.2-4).

During construction, impacts to waters of the US would be minimized by use of appropriate BMPs, such as limiting the overfilling of the dredge to reduce turbidity from spillage, restricting dredging anchoring, activities, and disposal near sensitive habitats, and conducting water quality monitoring to assess turbidity levels, and conducting sediment quality monitoring to assess contamination levels in source sands.

Additionally, ensuring the material on the beach is placed behind a sand berm would allow settlement of sediment before excess water is drained off and hence curtail turbidity (Moffatt & Nichol 2011b). Therefore, Project dredging activities would result in minimal impacts to marine water and sediment quality.

Avoidance and Minimization Measures

In addition to the AMMs described below for marine water and sediment quality, AMM HAZ-4a, which contains provisions in the event that dredge operators observe indications of hazardous or dangerous materials in dredge spoils, would minimize the disturbance and resuspension of any potentially contaminated sediments during dredging.

AMM MWSQ-3a: Water Quality Monitoring Construction contracts shall require ongoing water quality monitoring at both the borrow sites and offshore Broad Beach to assess turbidity levels.

AMM MWSQ-3b: Application of Best Management Practices. Construction contracts shall specify limits on dredge overfilling, restrict dredging and disposal near sensitive habitats, and restrict or designate anchor placement locations to avoid sensitive habitats or species.

Rationale for Avoidance and Minimization Measures

Monitoring of sediment and water quality during dredging and construction would ensure that substantial quantities of contaminated sediments are not disturbed or placed on the beach and that turbidity impacts will be limited to the extent practical. Project activities would result in increased turbidity during construction activities and during equilibration after nourishment or backpassing, but this turbidity would be an unsubstantial impact with application of the AMMs.

Impact MWSQ-4: Impacts to Water and Sediment Quality from Potential Marine Vessel Fuel Oil Spill

Water and sediment quality could be impacted by release of fuel oil from the hopper dredge or barges during Project activities following an allision, collision or grounding (Substantial, Class S).

Impact Discussion

A large spill of fuel oil would meet some or all of the threshold criteria for a significant water quality impact. A spill would introduce hydrocarbon contaminants that are persistent, could extend well beyond the Project area, could impact the marine ecosystem, and could measurably depart from background concentrations. Therefore, impacts to marine water quality from a large crude oil spill could be substantial. A typical hopper dredge holds 150,000 gallons of fuel oil, while a typical tugboat holds 35,000 gallons of fuel oil. While these volumes of oil are orders of magnitude less that that carried on a typical oil tanker, they are still substantial. However, a puncture of one of the fuel tanks on board these vessels would release only a portion of this fuel, as this total volume is contained in several tanks distributed about the vessels. Further, fuel tanks in tugboats are very well protected due to the thick hull of the tugboat.

Spilled oil results in several impacts to marine water quality explicitly addressed in the Ocean Plan. Surface slicks limit equilibrium exchange of gases at the ocean-atmosphere interface. This reduces near-surface oxygen concentrations, particularly with the increased biochemical oxygen demand of crude-oil emulsions. As the seawater-oil emulsion mixes into the water column, turbidity would increase and toxic hydrocarbons would be released into the water column and seafloor sediments. Although a surface slick can disperse within a few hours of a spill in harsh sea conditions, lingering effects could persist for much longer periods. For example, it took approximately 2 years for mussel tissue burdens of aromatic hydrocarbons to return to background levels after the Exxon Valdez Oil Spill (Boehm et al. 1995). Although this spill was several magnitudes larger than any spill possible under implementation of the Project, monitoring results indicate the potential for long-term effects. The increased potential for accidental discharges of petroleum hydrocarbons into marine waters are considered a significant impact because there is an increased likelihood of oil spill as a result of the Project and because such a spill would result in tangible damage to marine water quality in excess of concentrations identified in regulatory criteria.

Under CSLC guidance which suggests zero tolerance for oil spills as well as Federal and State regulations, even small oil spills could potentially be significant. Many regulations and guidelines establish limits based on the presence of a visible sheen on the ocean surface. This criterion is reflected in the static sheen test for free oil identified in the NPDES General Permit, USCG regulations, and the aesthetic criterion C.1 in the Ocean Plan Standards. However, there is a low probability of an allision, collision or grounding of a tugboat or hopper dredge severe enough to puncture a fuel tank. Further, if such an event were to occur it is most likely that it would occur in a port or harbor with extensive spill response capabilities. Implementation of AMM MWSQ-4a would enhance the preparedness of tugboat operators for spill response, making their preparedness more consistent with that of hopper dredges which are required under California regulations to prepare Oil Spill Contingency Plans. However, despite the low probability of a substantial spill and the increased preparedness resulting from implementation of AMMs, this impact would remain substantial.

<u>Avoidance and Minimization Measures</u>

In addition to the AMM described below for marine water and sediment quality, AMM HAZ-2a requires a Hazardous Materials Spill Prevention Control and Countermeasure Plan to minimize impacts of potential fuel/oil spills from vehicle/construction equipment used during beach nourishment activities.

AMM MWSQ-4a: Oil Spill Contingency Plan (OSCP) for Tugboats. Contracts for barging shall require that tugboat operators maintain an OSCP for the reasonable worst case scenario spill of fuel oil, based on a complete loss of fuel oil from their largest tank. Such a document could be prepared by the Applicant as a master OSCP for all barges. The OSCP would, at a minimum:

- Procedures to mitigate or avoid spills during an allision, collision or grounding.
- Delineate the procedures to be followed in the event of a fuel or oil release to water, including responsibilities for crew, notification, and record-keeping.
- Identify the on-board resources available to barge operators for initial response to a spill
- Provide the appropriate contact information for oil spill response agencies

<u>Rationale for Avoidance and Minimization Measures</u>

Implementation of these AMMs would reduce the probability of a fuel oil spill and the resulting consequences to the marine environment. The identified measures would enhance planning and preparedness to respond to the spill and would reduce both the potential spill size and the potential for spills. The measures would also increase the effectiveness of a spill cleanup effort.

<u>Residual Impacts</u>

Marine water quality impacts associated with accidental oil spills are categorized as significant because the proposed AMMs would not be completely effective in reducing the risk of a spill, nor would they eliminate the effects of a spill on marine resources. A spill could violate many water quality regulations and have a deleterious effect on the marine environment and biota. It would generate visible surface sheens, significantly reduce the penetration of natural light, reduce dissolved oxygen, degrade indigenous biota, and result in hydrocarbon contamination within the water column and marine sediments. The duration and area of the impact would be largely dictated by the size and location of the spill, and the various physical conditions of the sea at the time of the spill. Impacts would last from days to weeks and could extend for miles.

Mitigation of water quality impacts from a marine oil spill is largely a function of the efficacy of the spill response measures. The effectiveness of spill cleanup measures is dependent on the response time, availability and type of equipment, size of the spill, and the weather and sea state during the spill. Only some of these aspects are within the control of the spill response team. In addition, many oil spill response measures, such as dispersants, have impacts of their own.

1 **Table 3.2-2. Summary of Marine Water & Sediment Quality Impacts and AMMs**

Impact	Avoidance and Minimization Measures
MWSQ-1: Revetment Retention Impacts to Water Quality	**AMM TBIO-1a.** Implementation of a Comprehensive Dune Restoration Plan **AMM REC-5a.** Requirement of Additional Nourishment **AMM REC-5b.** Financial Surety for Revetment Removal **AMM REC-5c.** Sea Level Rise Effects
MWSQ-2: Beach Nourishment Impacts to Trancas Lagoon	**AMM MWSQ--2a.** Construction Limitations **AMM TBIO-4a.** Emergency Action Plan Measures Regarding Protection of Terrestrial Biological Resources **AMM TBIO-4b.** Maintain Equipment and Adhere to Work Plan **AMM TBIO-5a.** Maintain the Hydrology of Trancas Creek Lagoon and the Zuma Wetlands
MWSQ-3: Dredging and Nourishment Impacts to Marine Water and Sediment Quality	**AMM MWSQ-3a.** Water Quality Monitoring **AMM MWSQ-3b.** Implementation of BMPs **AMM HAZ-4a.** Response to Dredged Sand Contamination
Impact MWSQ-4: Impacts to Water and Sediment Quality from Potential Marine Vessel Fuel Oil Spill	**AMM MWSQ-4a.** Oil Spill Contingency Plan for Tugboats **AMM HAZ-2a.** Develop Hazardous Materials Spill Prevention Control and Countermeasure Plan